

Mr Michael Collon
Clerk of Sub-Committee 1
Select Committee on Science and Technology
Committee Office
House of Lords
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From the Biological Secretary and Vice-President Professor DJ Read FRS

Dear Mr Collon

We are delighted to respond to the Committee's call for evidence for the inquiry into 'Scientific Aspects of Ageing'. This response has been prepared in consultation with the following individuals: Professor Ian Deary, Professor Linda Partridge FRS and Professor Peter Wells FRS. We are aware that some of our Fellows have also submitted evidence to this inquiry in a professional or individual capacity.

Biological processes of ageing

Ageing is a normal process of functional decline that is near universal in living organisms. In humans, ageing is the major risk factor for multiple age-associated diseases, including cancer, heart disease, neurodegeneration and diabetes.

Genetic research in short-lived simple organisms such as yeast, nematode worm, fruit fly, mouse has identified genes that have an important influence on life span as well as a range of interventions that can delay many of the manifestations of ageing and thus opens new approaches to prolonging healthy life. Furthermore, advances in molecular biology, genetics and genomics are increasingly showing that principles established in model organisms can be translated across species. This now leads to unprecedented opportunities to increase our understanding of the intrinsic ageing process, how it constitutes a risk factor for multiple diseases and how interventions might improve health and activity during ageing.

The brain also is a major avenue for research on the scientific processes of ageing. Cognitive decline, also known as normal cognitive ageing, results in aspects of memory, reasoning, speed of mental processing and executive functioning declining as people grow older. These can lead to a major loss of independence and quality of life. There is still not enough known about the

phenotype of cognitive ageing: which mental processes deteriorate, when they do so, the brain basis of this change, and how the deterioration of mental processes correlate. There is still the lack of understanding of the biological basis for the 'common cause' hypothesis, the fact that age-related change in cognition is correlated with age-related changes in functions such as the senses, grip strength and lung function. In starting to find answers to these questions new ways have been developed to image the brain's white matter which allows hypotheses about cortical disconnection to be studied in relation to age-related cognitive change. In addition, much work also needs to be done to follow up ideas about oxidative damage as a basis for cognitive ageing and the many aspects of the genetic basis for cognitive ageing.

Stem cell research offers many opportunities for amelioration of age-associated decline and disease, and UK is particularly well placed to make progress in this area because it has one of the strongest regulatory systems in the world.

The UK is well positioned to contribute to and exploit these opportunities, although the current volume of research in this area is low compared with the United States. Using a combination of generic, theoretical and applied science, a balanced approach to the study of health during the later years of life can be achieved.

Application of research in technology and design

Technologies such as artificial joint replacement, cardiac pacemaking and continence control are applications of technology that have had and will continue to have an impact on extending the quality of life. To achieve further advances work needs to continue on the development of new materials, electronics and mechanics. These applications should not be considered in isolation but in conjunction with standard technologies that exist to support independent living such as communication and mobility aids; and housing design and modification.

Below is a classification of the kinds of relevant technology with which the inquiry might be concerned:

- Low technology: Mobility aids (e.g., canes, simple wheelchairs), vision devices (e.g., magnifiers, large print), hearing devices (e.g., assistive listening devices) and cognitive devices (e.g., pill organisers).
- High technology: Computer applications, wireless technology, information technology, pervasive computing, wearable computers, sensors and home monitoring.
- Transportation: Older driver safety, the role of high and low technology in enabling mobility later in life, and alternative (to personal vehicles) transportation approaches.
- Home modifications and universal design: The environment, both through retrofitting and new construction for people as they age.
- Injury prevention: Falls, fire safety, poisons, pedestrian safety and other issues relating to safe environments in the home and in the community.

In addition to technologies that support independent living, consideration should be given to those technologies which, generally, involve “health care” interventions which counteract or compensate for the adverse effects of the natural ageing processes and enhance the quality of life. The overriding objective being to keep people healthy until they die. These interventions include:

- Disease prevention
- Screening for diseases which meet appropriate criteria
- Diagnostic technologies, particularly in relation to cognition and prognosis
- Therapeutic procedures that extend quality life

Research priorities

The UK has started to respond to the challenges presented by the issues of research into ageing through ageing-related initiatives by several of the UK research councils (BBSRC, EPSRC, ESRC, MRC). There have been some criticisms of the co-ordination of research into ageing but we hope that the launch of the National Collaboration on Ageing Research will start to bring these initiatives together. The many lines of inquiry in ageing research will require longer-term support. For example, in cognitive ageing there are requirements: for longer duration studies on cohorts of subjects, for organising researchers in large-enough multidisciplinary teams, and for a more co-ordinated approach to funding. Further consideration should be given to co-ordination between the work funded by the Research Councils and the National Health Service effort. This will go some way to improving the difficult translation of research from the laboratory to application in clinical practice.

Although we agree that aspects of future funding of pensions are, rightly, out of remit of this inquiry there are however economic considerations that the inquiry might need to embrace. For example, as the capabilities of “health care” technologies increase, so, generally, do their costs. The escalating expenditure during the last few weeks and days of life is often cited. In the case of the elderly, approaches such as the cost of the QALY (quality-adjusted life year) will need to be refined to inform the opinion of society concerning resource allocation.

Should you wish any clarification or expansion of our views we would be happy to respond to any written queries and also to provide oral evidence to the Committee.

Yours sincerely

David J Read